



Solar System Simulator

DESCRIPTION

This online software generates views of the bodies of our planetary system at any date from any artificial or natural point of observation.

OBJECTIVES

Students will:

- Investigate how to determine the relative position of the sun, planets, and a number of planetary spacecraft using a simple web-based program
- Explore how planets change their position in space over time

NASA SUMMER OF INNOVATION

UNIT

Earth and Space Science – Year of the Solar System

GRADE LEVELS

7th – 9th

CONNECTION TO CURRICULUM

Science and technology

TEACHER PREPARATION TIME

1 hour

LESSON TIME NEEDED

30 minutes

Complexity: Basic

NATIONAL STANDARDS

National Science Education Standards (NSTA)

Science and Technology Standards

- Abilities of technological design
- Understanding about science and technology

Earth and Space Science

- Earth in the solar system
- Objects in the sky

Common Core State Standards for Mathematics (NCTM)

Number and Operations in Base Ten

- Perform operations with multi-digit whole numbers and with decimals to hundredths

Operations and Algebraic Thinking

- Generate and analyze patterns

ISTE NETS and Performance Indicators for Students (ISTE)

Creativity and Innovation

- Use models and simulations to explore complex systems and issues.

Technology Operations and Concepts

- Understand and use technology systems

MANAGEMENT

Take time to practice with this software. While simple, it offers a variety of views with which to become familiar.

On the simulator homepage, a FIELD OF VIEW of 2 will show the inner solar system very nicely.

It will be difficult to see the position of ALL the planets at one time. When all the planets are in view, inner planets cannot be seen.

MATERIALS

- *Computer with Internet access*

CONTENT RESEARCH

Go to SAMPLES at the bottom of the webpage, and practice positioning the items they list. The site provides a good overview of what the simulator is capable of doing and background information on the Solar System.

Solar System Exploration web site

<http://space.jpl.nasa.gov/>

<http://solarsystem.nasa.gov/planets/profile.cfm?Object=KBOs>

Sun - The sun is a star, a hot ball of glowing gases at the heart of our solar system

Mercury – The planet closest to the Sun, is only slightly larger than Earth's Moon. Like the Moon, Mercury has very little atmosphere to stop impacts, and it is covered with craters

Venus - is a dim world of intense heat and volcanic activity. Similar in structure and size to Earth, Venus' thick, toxic atmosphere traps heat in a runaway "greenhouse effect."

Earth - is an ocean planet. Our home world's abundance of water -- and life -- makes it unique in our solar system.

Earth's Moon - Makes Earth a more livable planet by moderating our home planet's wobble on its axis, leading to a relatively stable climate, and creating a rhythm that has guided humans for thousands of years.

Mars - is a cold desert world. It is half the diameter of Earth and has the same amount of dry land. Like Earth, Mars has seasons, polar ice caps, volcanoes, canyons and weather, but its atmosphere is too thin for liquid water to exist for long on the surface.

Asteroids - are rocky, airless worlds that orbit our sun, but are too small to be called planets. Tens of thousands of these "minor planets" are gathered in the main asteroid belt, a vast doughnut-shaped ring between the orbits of Mars and Jupiter.

Meteors - Little chunks of rock and debris in space are called meteoroids.

Jupiter - the most massive planet in our solar system -- with dozens of moons and an enormous magnetic field -- forms a kind of miniature solar system.

Saturn - Adorned with thousands of beautiful ringlets, Saturn is unique among the planets. All four gas giant planets have rings -- made of chunks of ice and rock -- but none are as spectacular or as complicated as Saturn's

Uranus - is the only giant planet whose equator is nearly at right angles to its orbit. A collision with an Earth-sized object may explain Uranus' unique tilt.

Neptune - Dark, cold and whipped by supersonic winds, Neptune is the last of the hydrogen and helium gas giants in our solar system.

Pluto - Discovered in 1930, Pluto was long considered our solar system's ninth planet. But after the discovery of similar intriguing worlds deeper in the distant Kuiper Belt, icy Pluto was reclassified as a dwarf planet.

Comets - are cosmic snowballs of frozen gases, rock and dust roughly the size of a small town. When a comet's orbit brings it close to the sun, it heats up and spews dust and gases into a giant glowing head larger than most planets. The dust and gases form a tail that stretches away from the sun for millions of kilometers.

Kuiper Belt & Oort Cloud - In 1950, Dutch astronomer Jan Oort proposed that certain comets come from a vast, extremely distant, spherical shell of icy bodies surrounding the solar system. This giant swarm of objects is now named the Oort Cloud, occupying space at a distance between 5,000 and 100,000 astronomical units.

LESSON ACTIVITIES

This lesson can be combined with the Solar Pizza activity(http://sunearthday.nasa.gov/2007/materials/solar_pizza.pdf) which allows one to make a scale model of the Sun/Earth system(limited space), and The Schoolyard Solar System(http://nssdc.gsfc.nasa.gov/planetary/education/schoolyard_ss/) which allows one to make a scale model of the whole solar system(large space availability).

ADDITIONAL RESOURCES

- JPL PHOTOJOURNAL-
Pictures of every body of the solar system
<http://photojournal.jpl.nasa.gov/index.html>
- Solar System Exploration
Everything you want to know about the solar system
<http://solarsystem.nasa.gov/index.cfm>
- Tonight's Sky
Shows what planets are visible and where to see them in the sky.
http://hubblesite.org/explore_astronomy/tonights_sky/

DISCUSSION QUESTIONS

- What are some of the spacecraft which are studying our solar system at this time? *Messenger, Mars Exploration Rovers, Mars Odyssey, Cassini*
- How do the position of planets in the sky change over time? *Move slowly across the sky, usually east to west over many months.*
- Can you see any planets in the sky tonight? This month? *Answers will vary depending on the time of the year.*

ASSESSMENT ACTIVITIES

Have students set up the simulator to show:

- Saturn and its Satellites from above
- All the planets of the solar system from above.
- A Lunar Eclipse.

ENRICHMENT

Kids

A website filled with a huge variety of solar system activities including games, puzzles, putting your name on spacecraft, and fun activities for students of all ages.

<http://www.jpl.nasa.gov/kids/index.cfm>